

# Oracle Academy Database Design Instructor Resource Guide

## INSTRUCTOR NOTES

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### SECTION 5 – Relationship Transferability Lesson

#### Slide 1: Relationship Transferability

No instructor notes for this slide

#### Slide 2: What Will I Learn? – Objectives

No instructor notes for this slide

#### Slide 3: Why Learn It? – Purpose

No instructor notes for this slide

#### Slide 4: Tell Me / Show Me –Relationship Review

**Transferable:** Property of a relationship between A and B, where an instance of A is related to an instance of B, and the association can be moved to another instance of B  
Reiterate that the relationship name must work from both perspectives.

#### **Optionality**

Can you have a TYPE that does not classify any SONG? (Yes)

Must every SONG have a TYPE? (Yes)

#### **Cardinality**

How many SONGs can be classified under one TYPE? (One or more)

How many TYPES can a SONG have? (Just one)

Note: Students may argue that a SONG can be classified by many TYPES. Agree, but tell them that the assumption for the DJ model is that although many TYPES can apply to a SONG, they want to track the main TYPE.

#### **Transferability**

Can a SONG be changed from one TYPE to another TYPE?

(Most likely the answer is yes, unless they have rigid rules about TYPE. Explain that this demonstrates a transferable relationship.)

#### Slide 5: Tell Me / Show Me – Nontransferable Relationships

**Nontransferable:** Property of a relationship where an instance of A is related to an instance of B, and the association cannot be moved to another instance of B

Nontransferable relationships are important to note because they usually reflect a business rule and will have implications when the ERD is implemented as a database – the foreign key column cannot be updated.

Assess the understanding of your students as you decide whether or not to discuss this with them.

Theoretically it doesn't matter at which end of the relationship you draw the diamond, but we always draw them at the "many" (crows-feet) end.

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#### Slide 6: Tell Me / Show Me – More Nontransferable Relationships

Begin a discussion in which you ask students to give other examples where they see a nontransferable relationship. Other examples of nontransferability that you can suggest: Should you be allowed to board a plane with a TICKET belonging to some other PASSENGER?

Would you want anyone to be able to transfer the AUTHORship of your EMAIL?  
How would you react if your CREDIT CARD ACCOUNT PRIVILEGES were transferred to another CUSTOMER?

Do you expect your PLACE IN a concert ticket WAITING LIST to be given away to another PERSON?

If your friend checks out books from the library and returns them late, would you expect that the fine be charged to you?

Have students name the relationship between two entities where you would want a nontransferable relationship e.g. between PATIENT and PRESCRIPTION, between ...

#### Slide 7: Tell Me / Show Me - Terminology

No instructor notes for this slide

#### Slide 8: Summary – Objectives Summarized

No instructor notes for this slide

#### Slide 9: Summary - Practice Guide

No instructor notes for this slide

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#### SECTION 5 – Relationship Types Lesson

##### Slide 1: Relationship Types

###### *Connections*

Explore the DJ model and point out the relationships between MUSIC and TYPE, EVENT and THEME, MUSIC and EVENT (this one is M:M), PARTNER and EVENT (this one is M:M).

##### Slide 2: What Will I Learn? – Objectives

This lesson expands the idea of cardinality to look at **both** ends of the relationship.

##### Slide 3: Why Learn It? – Purpose

Emphasize that getting the relationships right, asking the right questions to get them right, is crucial to modeling the business properly. Mistakes that are made now are much easier to correct at this stage than when the system is being built. (You might say to students, this is why they pay you the big bucks – to think of things that the client takes for granted or forgets!)

##### Slide 4: Tell Me / Show Me – One-to-Many (1:M) Relationships

**One-to-many (1:M):** A relationship where a single record in Table A can be related to one or more records in Table B, but a single record in Table B can only be related to one record in Table A

Note that the word “Many” can mean one-or-more or zero-or-more, depending on the optionality. Emphasize that “Many” does **not** mean “two-or-more”! The example given (mandatory on the many side, optional on the one side) is the most common. However, you may want to discuss other variations briefly, or just have them for your own background knowledge.

#### **Mandatory at both ends:**

This type of relationship typically models entities that cannot exist without each other. This usually represents an ideal situation (we cannot have ORDER ITEMS without ORDERs!). This is hard to implement in the physical database because it causes the “chicken and egg” problem (explain in detail).

#### **Mandatory on the one side, optional on the many side:**

This is rarely used. You will see it only when the relationship expresses that an entity instance exists only when it is a nonempty set, and where the elements of the set can exist independently. In the example below, a MUSICIAN may be part of one BAND. According to the model, a BAND is of no interest if it is empty. How can you have a BAND without MUSICIANs?

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#### Slide 5: Tell Me / Show Me – Many-to-Many (M:M) Relationships

**Many-to-many (M:M):** A relationship in which many records in one table match many records in another table

Remind students that we have seen examples of these already. In the next lesson, we will learn to resolve them.

#### Slide 6: Tell Me / Show Me – One-to-One Relationships For Roles

**One-to-one:** A relationship where each record in Table A can be related to one, and only one, record in Table B, and each record in Table B relates to one, and only one, record in Table A

The slide example is interesting. Alternatively, TEACHER and STUDENT could have been modelled as subtypes of PERSON, unless a PERSON can be both a TEACHER and a STUDENT at the same time.

#### Slide 7: Tell Me / Show Me – One-to-One Relationships For Process

##### **Mandatory 1:1**

A 1:1 relationship, mandatory at both ends, tightly connects two entities: when you create an instance of one entity, there must be exactly one dedicated instance for the other simultaneously; for example, entity PERSON and entity BIRTH. Each PERSON must be the result of one and only one BIRTH. Each BIRTH must result in one and only one PERSON.

This leads to the question why you want to make a distinction between the two entities anyway. The only acceptable answer is: only if there is a business need, such as keeping birth records separate from person records. Note that someone may point out that the above relationship does not apply to twins, triplets, etc. Point out that those are considered multiple births (one birth per baby!).

#### Slide 8: Tell Me / Show Me – Redundant Relationships

**Redundancy:** Something that is unnecessarily repetitive, the state of being unnecessarily repetitive

On the left side, if a person lives in town A, which is in country B, then we can conclude that the person lives in country B.

However, on the right side, the relationship is **nonderivable**: “born in/the birthplace of.” Just because a person lives in town A, which is in country B, does not automatically mean that the person was born in country B.

#### Slide 9: Tell Me / Show Me - Terminology

No instructor notes for this slide

# **Oracle Academy Database Design Instructor Resource Guide**

*Slide 10: Summary – Objectives Summarized*

No instructor notes for this slide

*Slide 11: Summary - Practice Guide*

No instructor notes for this slide

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#### SECTION 5 – Resolving Many-to-Many Relationships Lesson

##### Slide 1: Resolving Many-to-Many Relationships

No instructor notes for this slide

##### Slide 2: What Will I Learn? – Objectives

No instructor notes for this slide

##### Slide 3: Why Learn It?— Purpose

Draw an M:M relationship between STUDENT and CLASS. Point out that each student may attend one or more classes and each class may be attended by one or more students. Where in the ERD do we locate the grade that a student gets in a class?

If we put a grade attribute in STUDENT, how do we know which class it's for? If we put it in CLASS, how do we know which student got the grade?

The grade is an attribute of the many-to-many relationship between STUDENT and CLASS, not of either entity alone.

##### Slide 4: Tell Me / Show Me – Relationship Hiding an Attribute

If we put the status attribute in EVENT, how do we know which PARTNER worked on the event? If the status is “called client to confirm meeting,” who is meeting with the CLIENT – the event manager, the DJ?

If we put the status attribute in PARTNER, how do we know which EVENT the status is referring to?

Status is an attribute of the relationship between PARTNER and EVENT, not of either entity alone.

##### Slide 5: Tell Me / Show Me – Resolution of a M:M Relationship

Since every attribute must belong to an entity, we need a third entity.

##### Slide 6: Tell Me / Show Me – Intersection Entity

**Intersection entity:** The product of the resolution of a many to many relationship

Explain why the optional M:M relationship has become mandatory at the Many end of the M:1 relationships.

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#### Slide 7: Tell Me / Show Me – Barred Relationships

**Barred relationship:** A relationship that participates in an entity's unique identifier. When explaining the UID of an intersection entity, it may help to show data examples. For EVENT and PARTNER, it may help to write out the data of JOB ASSIGNMENT, and point out that the combination of EVENT identifier and EMPLOYEE identifier uniquely identifies a job.

If the modeler decides that it is the combination of UIDs of the originating relationships that will serve as the primary UID of the intersection entity, then the relationships are drawn with the bars to represent this. However, it is important to realize that in some cases, the modeler may decide to create an “artificial UID” for the intersection entity. In this case, the relationships are not barred. The artificial UID may be the best option if the UIDs of the originating entities are composite (made up of two or more attributes). Creating an artificial UID may just be a simpler choice.

In some cases, the UID of the intersection entity will contain additional attributes of that entity alone, especially when tracking changes over time is considered.

#### Slide 8: Tell Me / Show Me – M:M Resolution Example TV Shows

What would be the UID of VIEWING RECORD? Could it have any non-UID attributes? When did the PERSON watch the TV SHOW? Since a TV show is broadcast at a single time (therefore everyone watches it at the same time), the viewing time should be an attribute of TV SHOW.

Again, the optional M:M relationship has become mandatory in the M:1 relationships. Some PERSONs may never watch TV, and some TV SHOWs may not be watched by anyone! But an instance of VIEWING RECORD records the fact that a PERSON **did** actually watch a TV SHOW.

#### Slide 9: Tell Me / Show Me – M:M Resolution Example Cleaning Services

Would CLEANING SCHEDULE have any non-UID attributes? Yes, because the schedule date (when the cleaning takes place) is an attribute of the schedule, not of the company or the service.

#### Slide 10: Tell Me / Show Me – Terminology

No instructor notes for this slide

#### Slide 11: Summary – Objectives Summarized

No instructor notes for this slide

#### Slide 12: Summary - Practice Guide

No instructor notes for this slide

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#### SECTION 5 – Understanding CRUD Requirements Lesson

##### Slide 1: Understanding CRUD Requirements

###### Lesson Preparation

CRUD analysis ties data modeling to business functions. Although functional modeling – what operations are carried out on the data, not just what data is modeled - is not covered in this course, students do need to realize that the business functions and processes that the client describes will operate on the data. CRUD analysis checks that all the appropriate operations are possible. This is a good tool to check for completeness and proper scope of the data model.

##### Slide 2: What Will I Learn? – Objectives

No instructor notes for this slide

##### Slide 3: Why Learn It? – Purpose

**Consultant:** One who gives expert or professional advice.

Tell them that CRUD analysis will be explained in this lesson.

##### Slide 4: Tell Me / Show Me – CRUD Analysis

**CRUD analysis:** The practice of checking a data model for create, retrieve, update and delete functions that the business requires

**Functions:** Used to perform calculations on data, modify individual data items, manipulate output for groups of rows, format dates and numbers for display, convert column datatypes

Remind them that a client often describes business functions as part of the scenario. For example:

“Whenever we get a new customer, we take down basic information (name, address, email) and assign an ID.” (CREATE)

“We’d like to print out a list of songs to be played at each event.” (RETRIEVE)

“The event manager reserves the location and may do a site visit. Then she notes down the status and date of each job.” (UPDATE)

“A number of our customers were small companies that were hit hard by the recession. They went out of business. We deleted them from our current records.” (DELETE)

An alternative acronym for CRUD is BREAD: **B**rowse, **E**nter, **A**lter, **D**elete.

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#### Slide 5: Tell Me / Show Me – Create Operation

Another example you can use is from the DJ business scenario:

“Each event is tied to a customer. A customer can ask us to work at many events.”

**Ask students:** Does the ERD have a relationship that reflects this?

**Answer:** Yes, it’s the relationship between CUSTOMER and EVENT and the relationship between JOB ASSIGNMENT and PARTNER.

#### Slide 6: Tell Me / Show Me – Retrieve Operation

No instructor notes for this slide

#### Slide 7: Tell Me / Show Me – Update Operation

Here’s another DJ example that you can use:

“We don’t allow customers to transfer ownership of an event to another customer.”

This points to a nontransferable relationship, which will disallow updates to certain attributes in the associated entity. In this case, your data model must show a nontransferable relationship between CUSTOMER and EVENT.

#### Slide 8: Tell Me / Show Me – Delete Operation

**Obsolete:** No longer in use

You may want to mention that businesses often don’t delete data – they just flag it as obsolete, or they keep an archive of it. One of the rare occasions that they do want to delete a record from the database is if it’s entered erroneously.

#### Slide 9: Tell Me / Show Me – CRUD Validation

You can explain CRUD to the class as a way of checking their ERDs.

Students whose first language is English will like the acronym CRUD – in slang, it means something disagreeable or disgusting: “I haven’t cleaned my bedroom for months, it looks like a heap of crud”.

#### Slide 10: Tell Me / Show Me - Terminology

No instructor notes for this slide

#### Slide 11: Summary – Objectives Summarized

No instructor notes for this slide

#### Slide 12: Summary - Practice Guide

No instructor notes for this slide

# Oracle Academy Database Design Instructor Resource Guide

## PRACTICE SOLUTIONS

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### SECTION 5 – Relationship Transferability Lesson

#### Vocabulary

Directions: Identify the vocabulary word for each definition below.

#### **Transferable**

Property of a relationship between A and B, where an instance of A is related to an instance of B, and the association can be moved to another instance of B.

#### **Nontransferability**

Property of a relationship where an instance of A is related to an instance of B, and the association cannot be moved to another instance of B

#### Try It / Solve It

1. Draw softboxes for each of the following. Draw relationship lines and correctly label each relationship in both directions. Indicate non-transferability when appropriate.
  - a. Each town may be the birthplace of many people. Each person must be born in one and only one town.
  - b. Each room may house one or more guests. Each guest may stay in one and only one room.
  - c. Each employee must work for one and only one department. Each department may have one or more employees.
  - d. Each hotel may be the host of one or more guests. Each guest may be hosted in one or more hotels.
  - e. Each message must be addressed to one or more persons. Each person may be the addressee of one or more messages.
  - f. Each garment must have one and only one price. Each price may be for one or more garments.
  - g. Each airline coupon must be used for one and only one destination. Each destination may be visited with one or more coupons.

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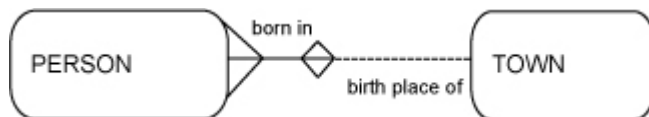
- h. Each automobile must use one and only one tire size. Each tire size may be used by one or more automobiles.
- i. Each child must have one and only one mother. Each mother must be the parent of one or more children.
- j. Each person must be of one and only one blood type. Each blood type may classify one or more persons.
- k. A person may be on one or more junk-mail lists. Each junk list may contain one or more persons.
- l. Each student may learn from one or more teachers. Each teacher may educate one or more students.
- m. Each school may be attended by one or more honor students. Each honor student must attend one and only one school.
- n. Each fingerprint must belong to one and only one person. Each person must have one and only one fingerprint.

## Solution:

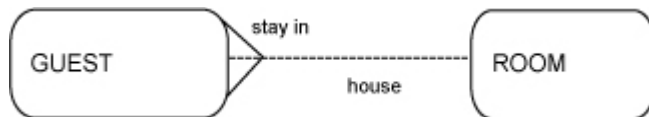
Some of the M:1 relationships could easily be M:M when modeled over time (such as ROOM and GUEST, HOTEL and GUEST, EMPLOYEE and DEPARTMENT).

If someone points that out, tell them that we are looking at a single point in time right now, but we will tackle the time element very soon

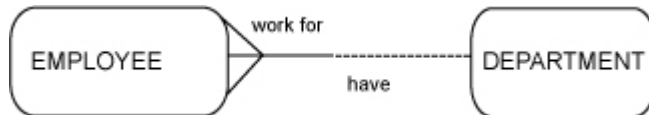
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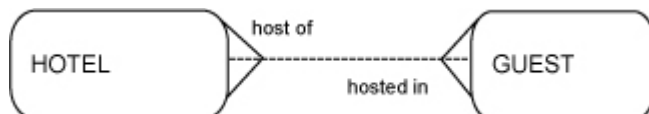
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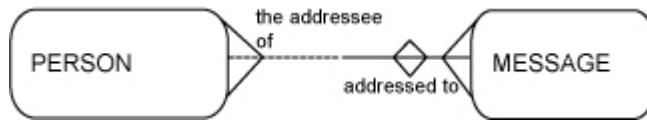


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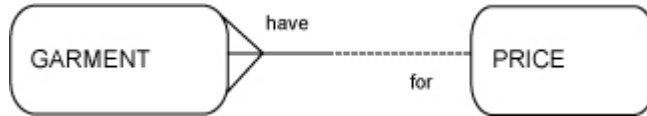


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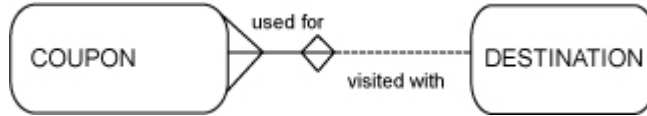
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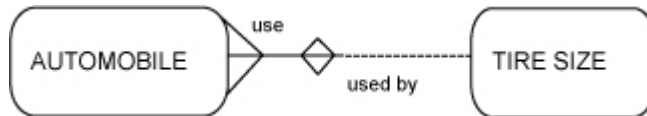
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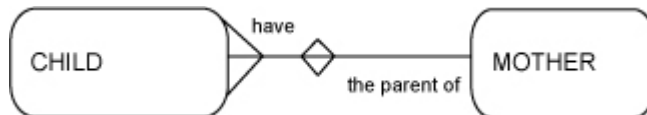
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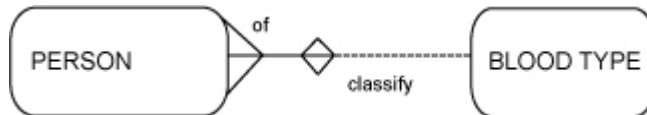
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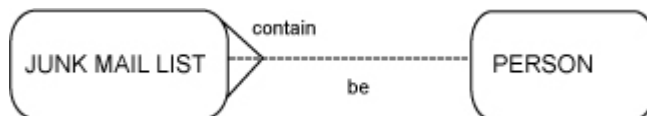
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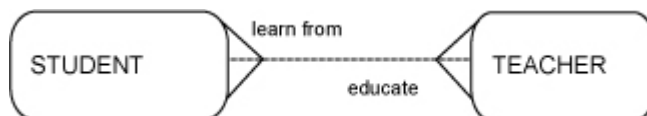
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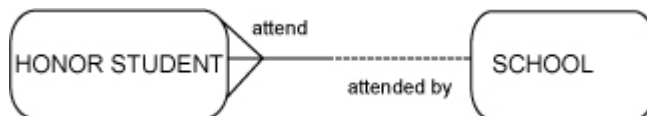
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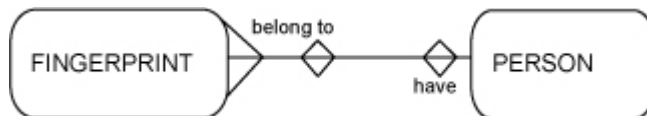
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#### SECTION 5 – Relationship Types Lesson

##### Vocabulary

Directions: Identify the vocabulary word for each definition below.

<b><u>One-to-one (1:1)</u></b>	A relationship where each record in Table A can be related to one, and only one, record in Table B, and each record in Table B relates to one, and only one, record in Table A.
<b><u>One-to-many (1:M)</u></b>	A relationship where a single record in Table A can be related to one or more records in Table B, but a single record in Table B can only be related to one record in Table A.
<b><u>Many-to-many (M:M)</u></b>	A relationship in which many records in one table match many records in another table
<b><u>Redundant</u></b>	Unnecessarily repetitive

##### Try It / Solve It

1. Identify the relationship types of the statements below

Type	Statement
	A snowboard instructor may instruct one or more snowboarders
	A bicycle may be owned by a child
	Classroom crayons may be used by students in a classroom
	A passport belongs to a person
	A female elephant gives birth to an elephant

##### **Solution:**

One-to-many  
One-to-one  
Many-to-many  
One-to-one  
One-to-one

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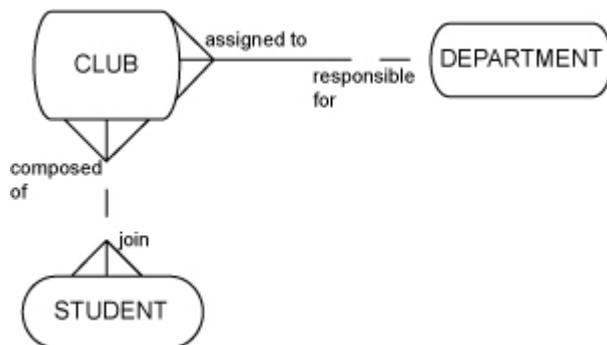
2. Provide two examples for each relationship type.

Relationship Type	Example
One-to-one	
One-to-one	
One-to-many	
One-to-many	
Many-to-many	
Many-to-many	

**Solution:** Answers will vary.

3. Draw an entity relationship diagram to represent the following:
- Each CLUB must be assigned to one and only DEPARTMENT
  - Each DEPARTMENT may be responsible for one or more CLUBS
  - Each STUDENT may join one or more CLUBS
  - Each CLUB may be composed of one or more STUDENTS

**Solution:** You can use existing clubs in your school as an example. If they don't belong to a department, ask the students which academic department they "could" belong to, if that was a business rule. See if majority of the class has modeled the M:M relationship correctly. You may want to call attention to it, and say that they will learn more about it in the next lesson.



# Oracle Academy Database Design Instructor Resource Guide

## SECTION 5 – Resolving Many-to-Many Relationships Lesson

### Vocabulary

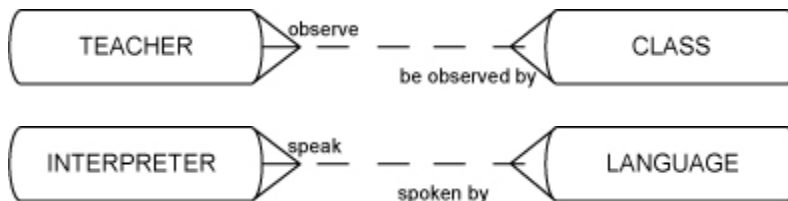
Directions: Identify the vocabulary word for each definition below.

**Barred relationship** A relationship that participates in an entity's unique identifier.

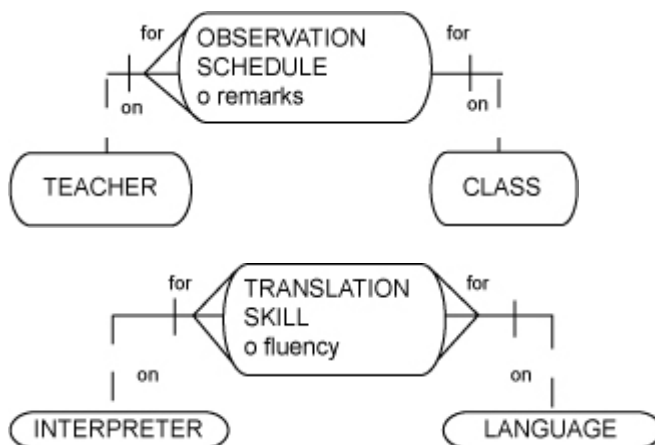
**Intersection entity** The product of the resolution of a many to many relationship.

### Try It / Solve It

1. Resolve the M:M between TEACHER and CLASS as well as INTERPRETER and LANGUAGE. For each intersection entity, think of additional attributes like a UID.



**Solution:** Some intersection entities will look “empty,” and this can confuse the students. Point out that this doesn’t mean that there are no attributes. There is at least a UID for this entity, and it is a combination of the UIDs of the originating entities. In the ERD, we don’t put the same attribute in two different places, so we represent this with the bar.



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#### SECTION 5 – Understanding CRUD Requirements Lesson

##### Vocabulary

Part One: Define the vocabulary words below.

1. Consultant
2. Functions
3. Obsolete
4. CRUD analysis

<b>Consultant</b>	One who gives expert or professional advice
<b>CRUD analysis</b>	The practice of checking a data model for create, retrieve, update and delete functions that the business requires
<b>Functions</b>	Used to perform calculations on data, modify individual data items, manipulate output for groups of rows, format dates and numbers for display, convert column datatypes.
<b>Obsolete</b>	No longer in use

Part Two: Based on the lecture list the tasks that will apply to the parts of CRUD analysis. (Examples: bring up, find, modify, read, etc.)

1. Create
2. Retrieve
3. Update
4. Delete

<b>Update</b>	Alter
<b>Retrieve</b>	Bring up
<b>Update</b>	Change
<b>Delete</b>	Discard
<b>Create</b>	Enter
<b>Retrieve</b>	Find
<b>Create</b>	Import
<b>Create</b>	Input
<b>Create</b>	Load
<b>Retrieve</b>	Look up

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<b>Update</b>	Modify
<b>Retrieve</b>	Print
<b>Delete</b>	Purge
<b>Retrieve</b>	Read
<b>Create</b>	Record
<b>Delete</b>	Remove
<b>Retrieve</b>	Report
<b>Delete</b>	Trash
<b>Retrieve</b>	View

#### Try It / Solve It

1. Relate CRUD analysis to a school enrollment environment. Consider the data or information used in a school and identify at least one example for create, retrieve, update, and delete.

#### **Solution:**

Answers will vary. Suggested responses:

**Create** – As new students enter the school, they will need to be added to the database.

**Retrieve** – The school must retrieve attendance and grade records for specific reports and meetings.

**Update** – When a student's address, course grade, or parent contact changes, it must be updated.

**Delete** – After five years, attendance records of students need to be deleted from our records.